

10.4 Test Results

Test mode	Test Channel (MHz)	26dB Bandwidth (MHz) ANT1	Limit (MHz)
802.11a	5180	23.909	≥ 0.5
	5200	23.119	≥ 0.5
	5240	24.179	≥ 0.5
802.11a20	5180	23.947	≥ 0.5
	5200	23.79	≥ 0.5
	5240	23.432	≥ 0.5
802.11a40	5190	42.201	≥ 0.5
	5230	41.598	≥ 0.5
802.11a80	5210	79.292	≥ 0.5
802.11n(HT20)	5180	23.417	≥ 0.5
	5200	23.365	≥ 0.5
	5240	22.789	≥ 0.5
802.11n(HT40)	5190	41.758	≥ 0.5
	5230	41.664	≥ 0.5

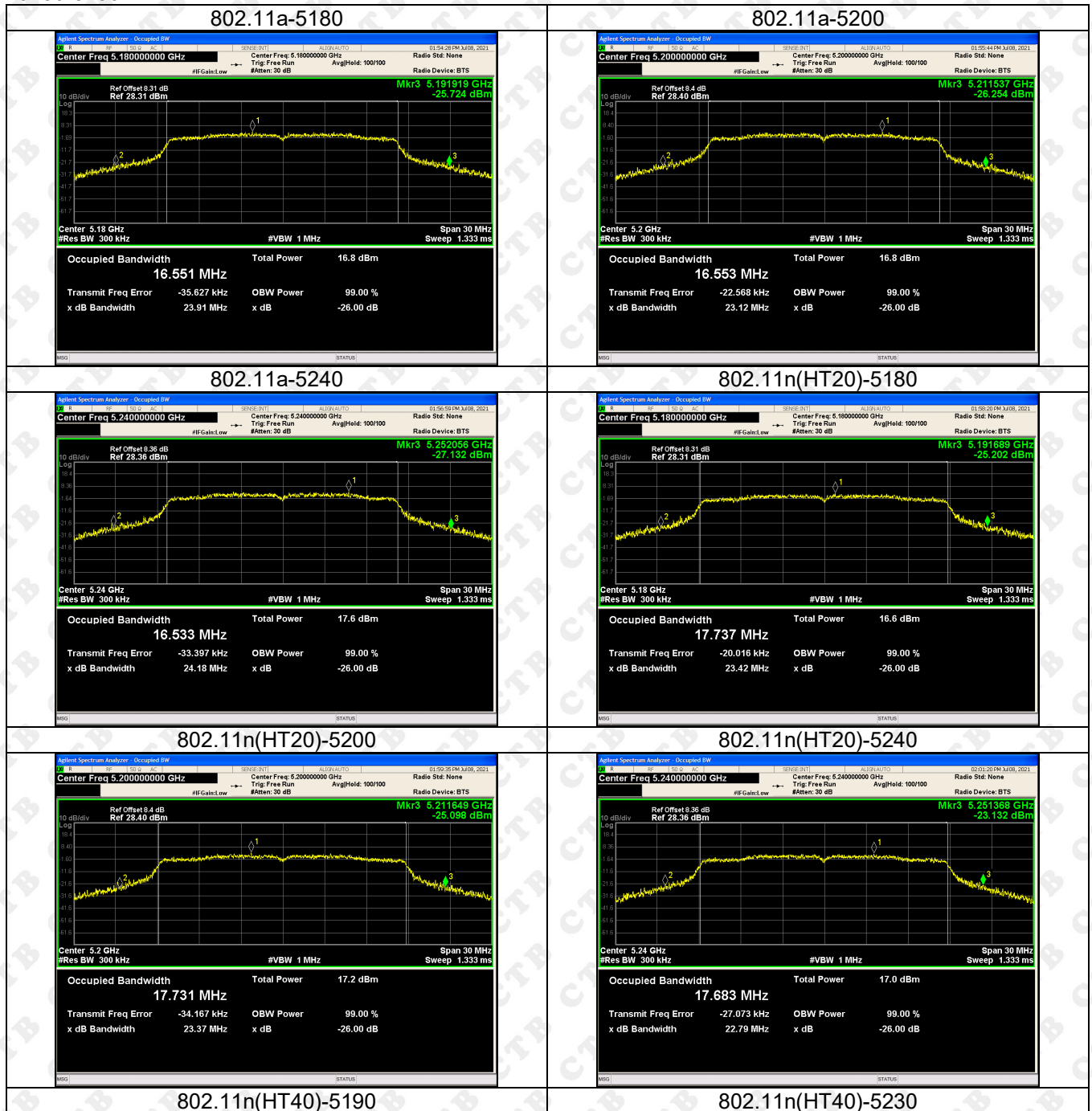
Test mode	Test Channel (MHz)	26dB Bandwidth (MHz) ANT2	Limit (MHz)
802.11a	5180	23.423	≥ 0.5
	5200	23.432	≥ 0.5
	5240	22.547	≥ 0.5
802.11a20	5180	23.06	≥ 0.5
	5200	24.168	≥ 0.5
	5240	23.32	≥ 0.5
802.11a40	5190	42.173	≥ 0.5
	5230	40.992	≥ 0.5
802.11a80	5210	79.429	≥ 0.5
802.11n(HT20)	5180	23.732	≥ 0.5
	5200	24.537	≥ 0.5
	5240	23.89	≥ 0.5
802.11n(HT40)	5190	43.484	≥ 0.5
	5230	42.159	≥ 0.5

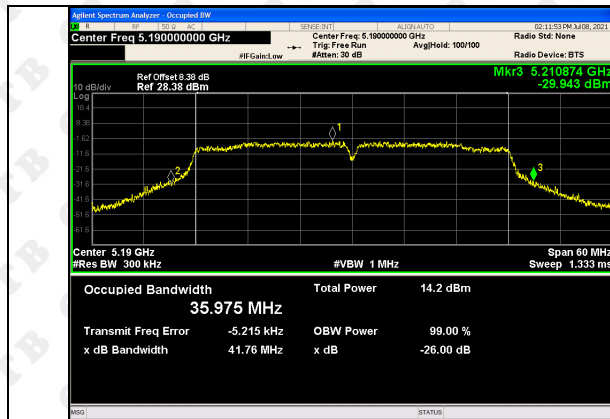
Test mode	Test Channel (MHz)	6dB Bandwidth (MHz) ANT1	99% Bandwidth (MHz)	Limit (MHz)
802.11a	5745	15.116	16.475	≥ 0.5
	5785	14.138	16.498	≥ 0.5
	5825	13.187	16.442	≥ 0.5
802.11a20	5745	17.293	17.656	≥ 0.5
	5785	15.028	17.677	≥ 0.5
	5825	14.961	17.634	≥ 0.5
802.11a40	5755	35.074	35.997	≥ 0.5
	5795	35.068	36.182	≥ 0.5
802.11a80	5775	75.057	75.512	≥ 0.5
802.11n(HT20)	5745	13.802	17.671	≥ 0.5
	5785	16.039	17.696	≥ 0.5
	5825	14.797	17.625	≥ 0.5
802.11n(HT40)	5755	33.824	36.068	≥ 0.5
	5795	32.513	36.183	≥ 0.5

Test mode	Test Channel (MHz)	6dB Bandwidth (MHz) ANT2	99% Bandwidth (MHz)	Limit (MHz)
802.11a	5745	15.288	16.405	≥ 0.5
	5785	13.862	16.397	≥ 0.5
	5825	15.013	16.384	≥ 0.5
802.11a20	5745	13.744	17.567	≥ 0.5
	5785	15.437	17.607	≥ 0.5
	5825	13.895	17.591	≥ 0.5
802.11a40	5755	34.977	35.950	≥ 0.5
	5795	35.105	36.104	≥ 0.5
802.11a80	5775	75.091	75.472	≥ 0.5
802.11n(HT20)	5745	15.139	17.601	≥ 0.5
	5785	13.794	17.597	≥ 0.5
	5825	15.878	17.589	≥ 0.5
802.11n(HT40)	5755	32.593	35.931	≥ 0.5
	5795	35.099	36.230	≥ 0.5

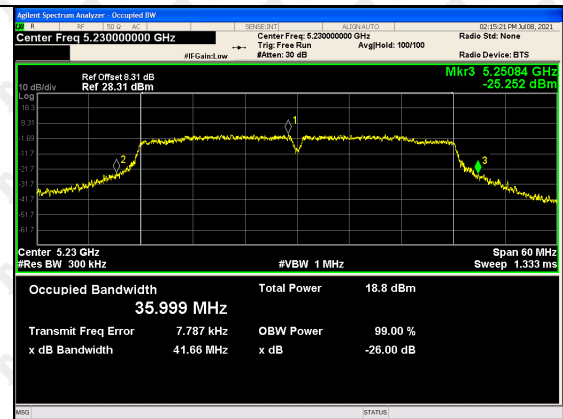
Test Graph

5180-5230MHz ANT1

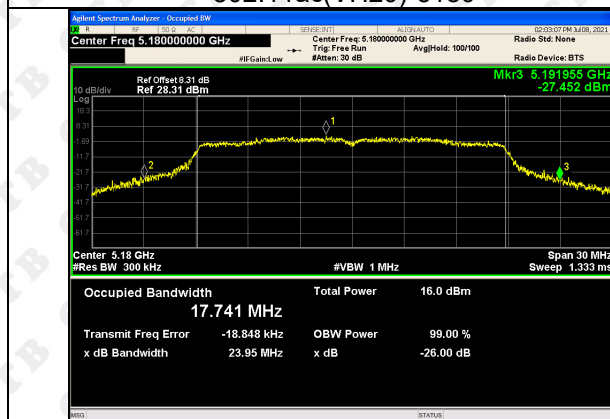




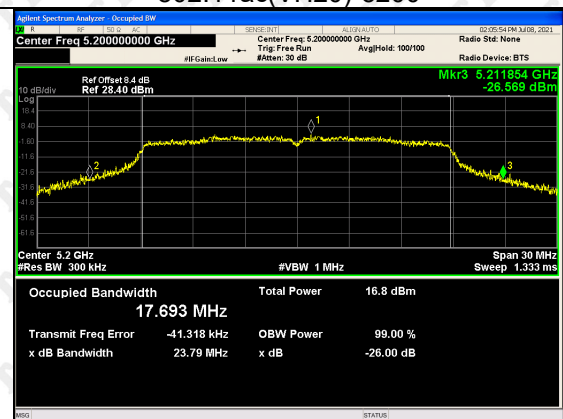
802.11ac(VH20)-5180



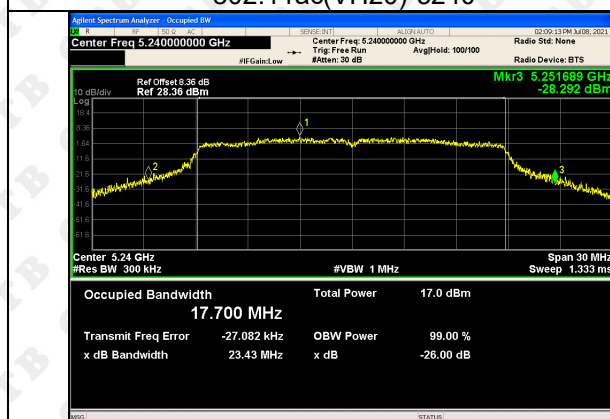
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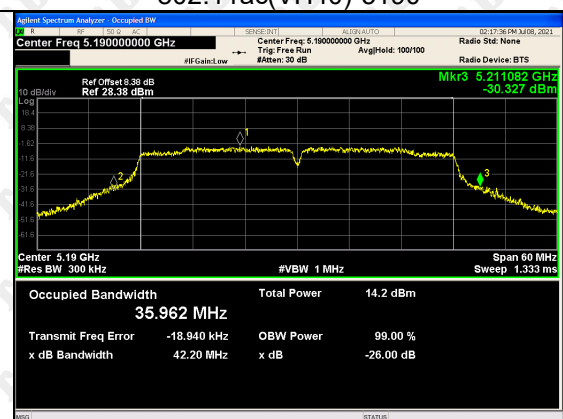
802.11ac(VH20)-5240



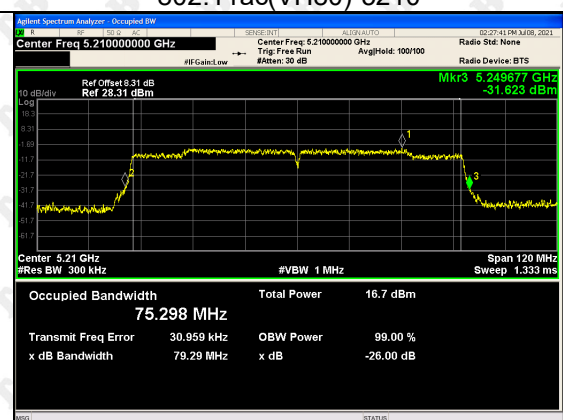
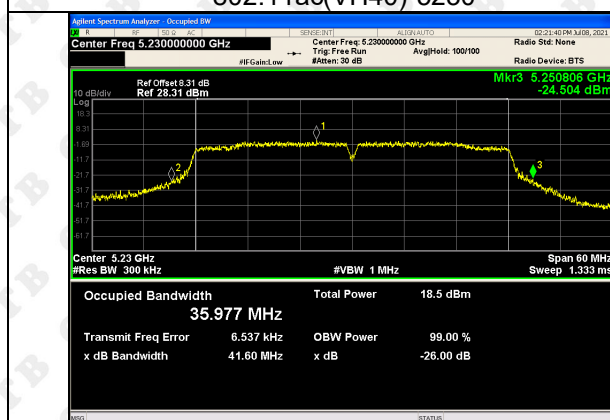
802.11ac(VH40)-5190



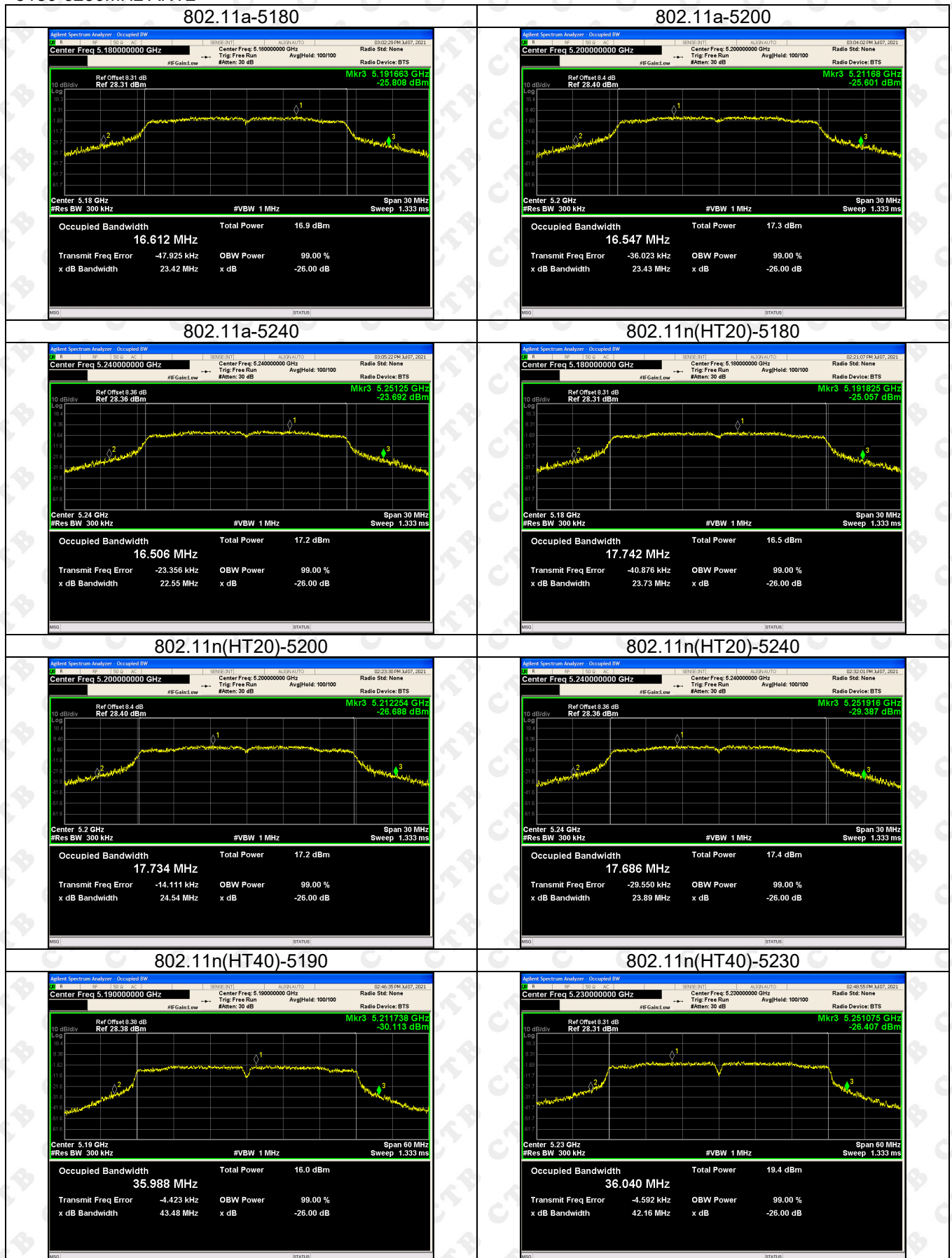
802.11ac(VH40)-5230



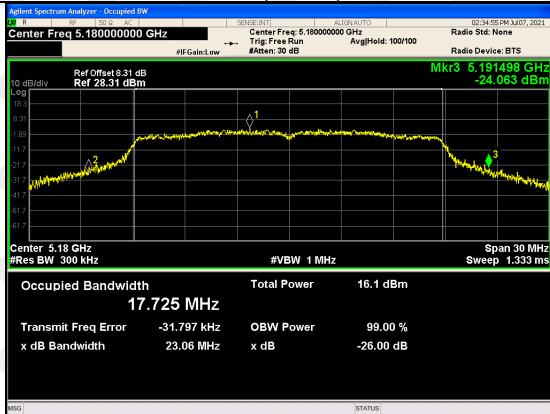
802.11ac(VH80)-5210



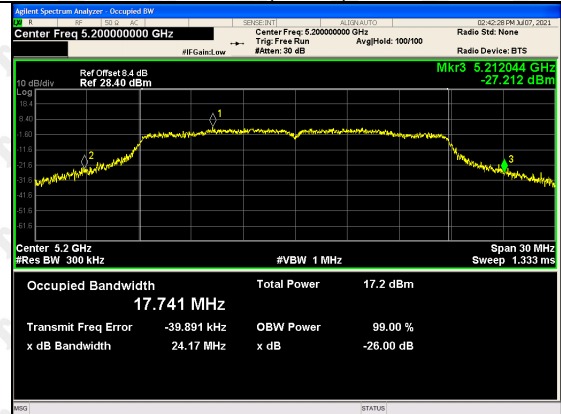
5180-5230MHz ANT2



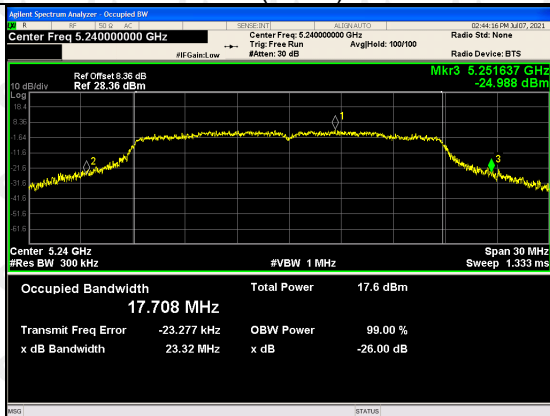
802.11ac(VH20)-5180



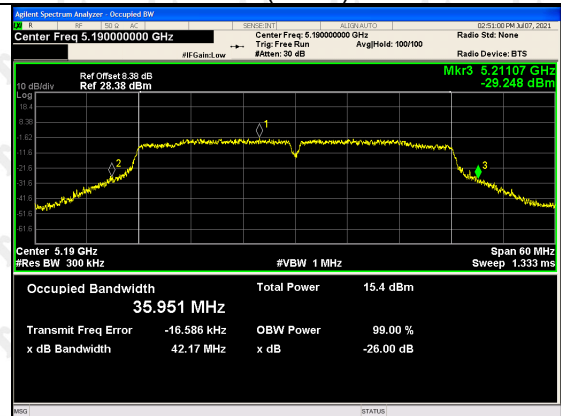
802.11ac(VH20)-5200



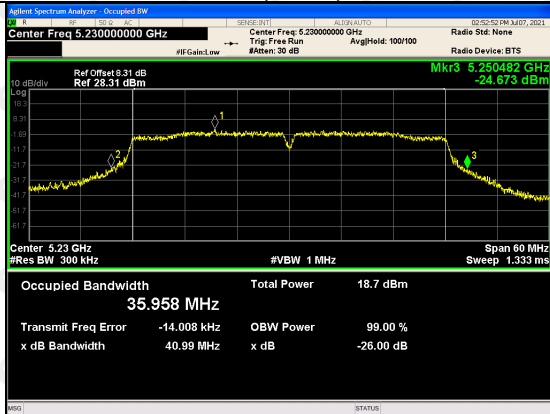
802.11ac(VH20)-5240



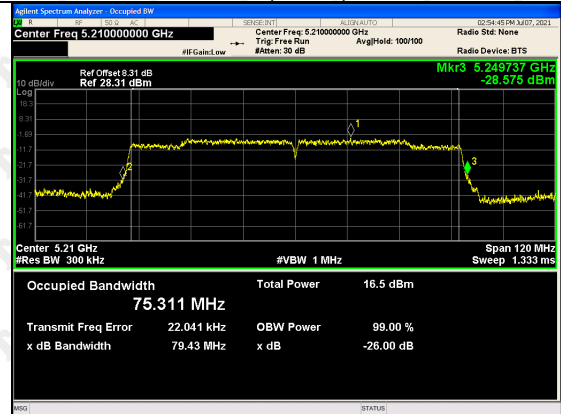
802.11ac(VH40)-5190



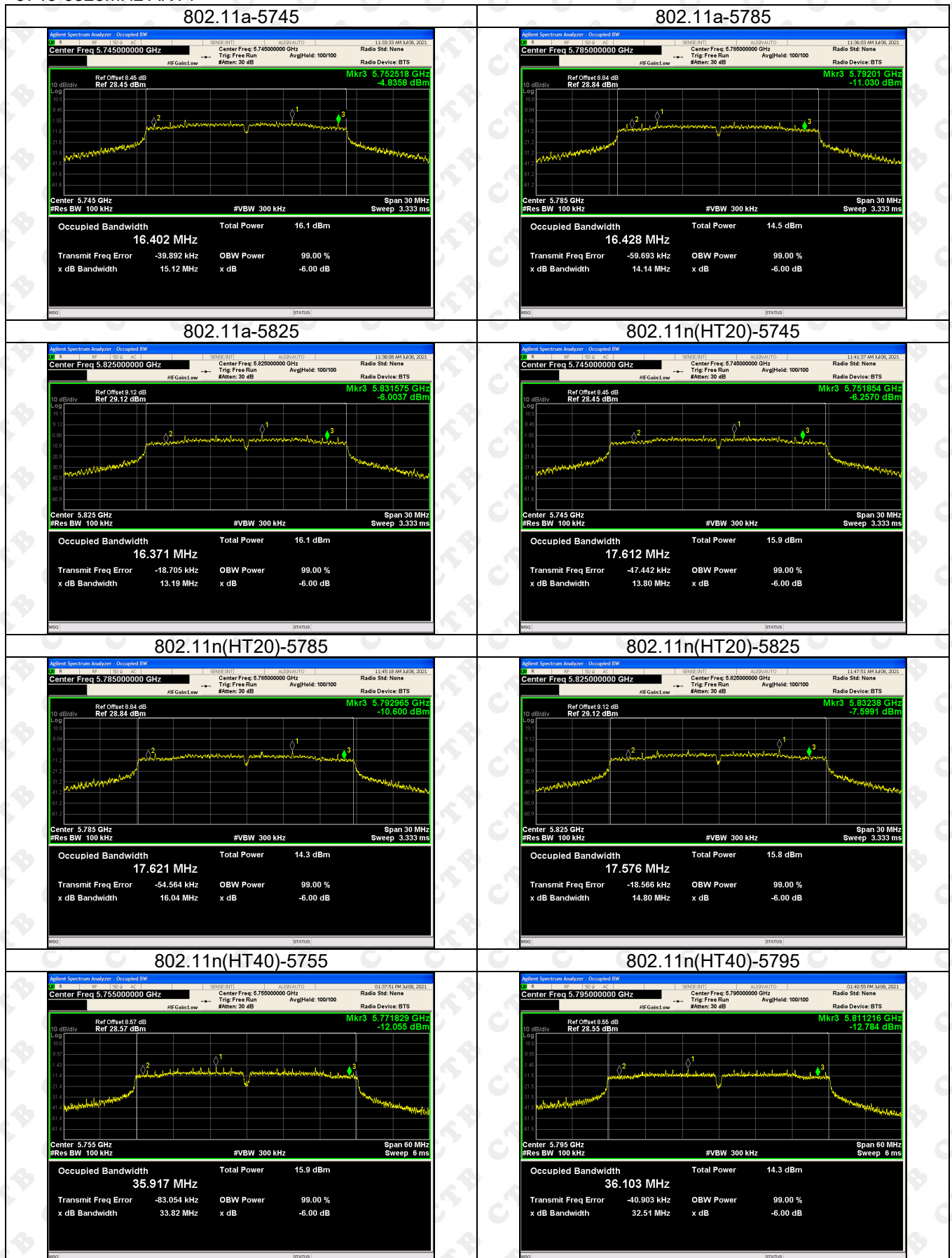
802.11ac(VH40)-5230



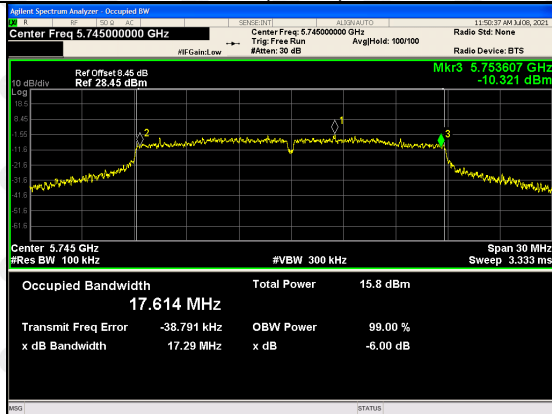
802.11ac(VH80)-5210



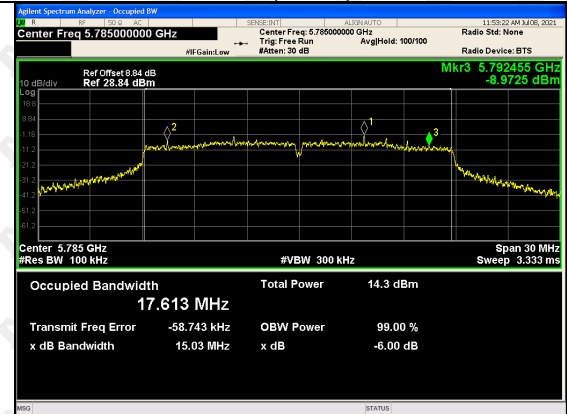
5745-5825MHz ANT1



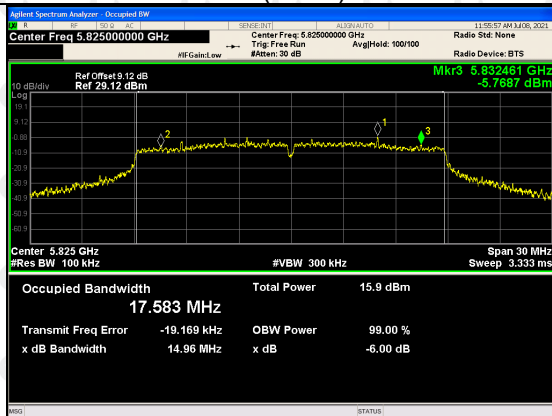
802.11ac(VH20)-5745



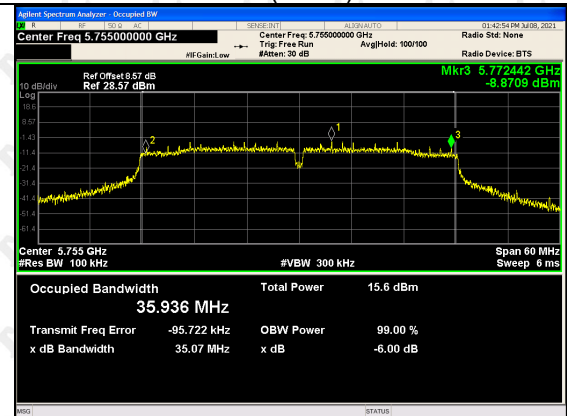
802.11ac(VH20)-5785



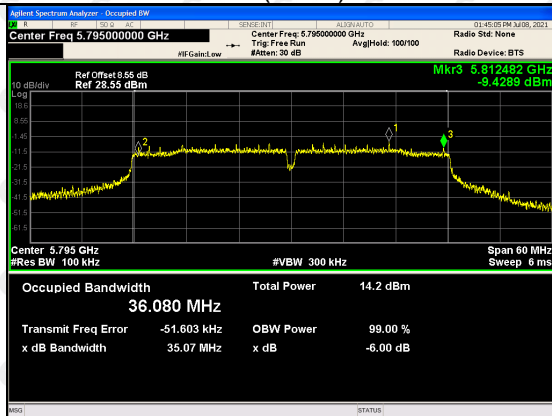
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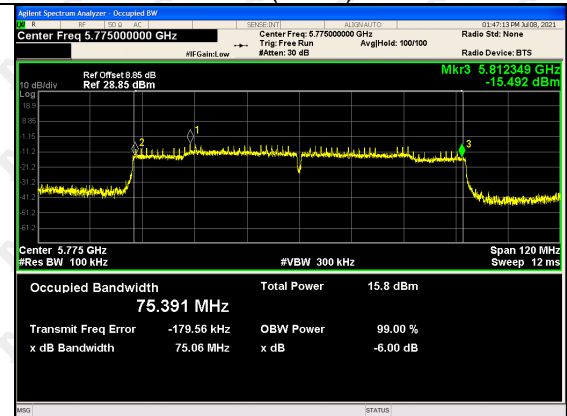
802.11ac(VH40)-5755



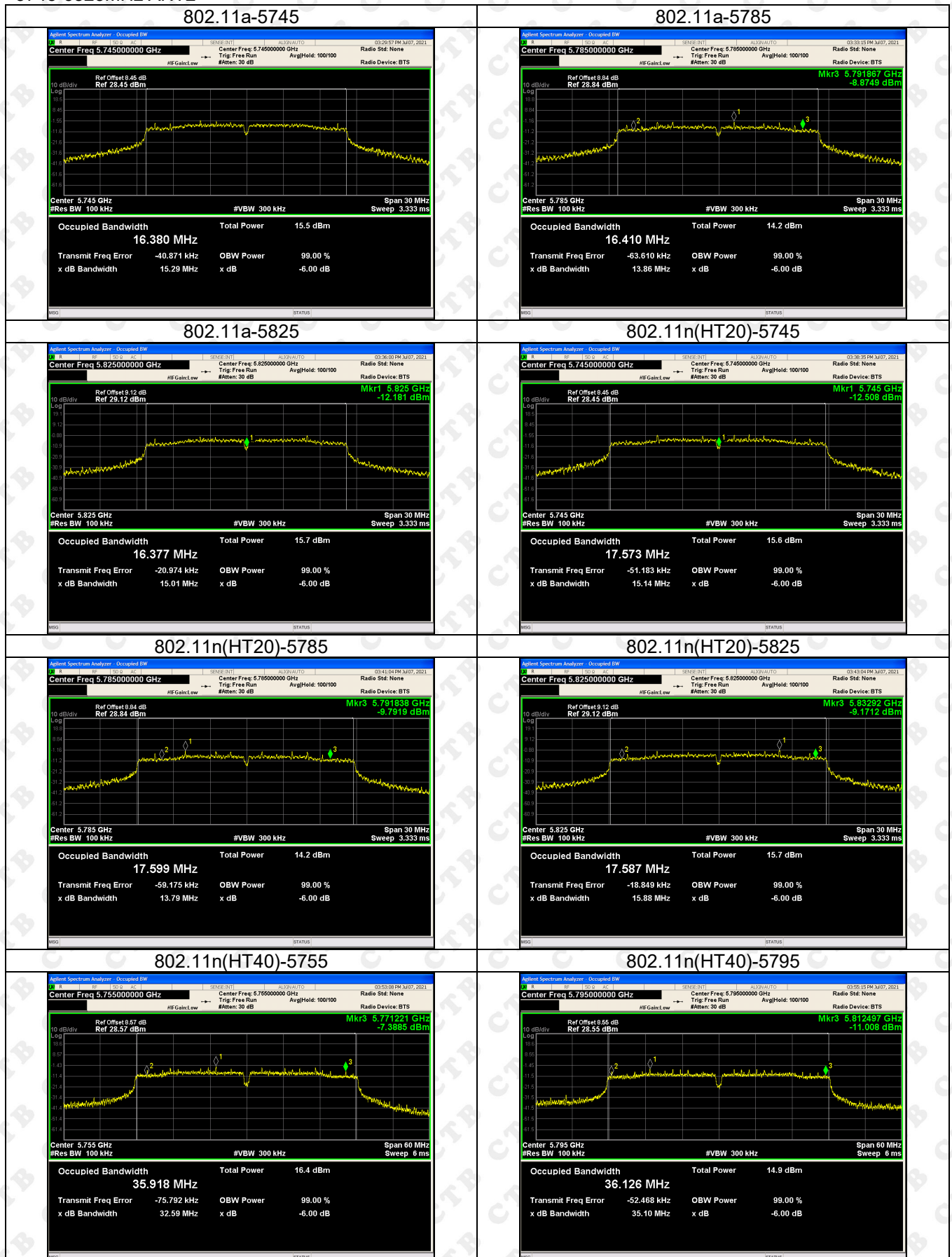
802.11ac(VH40)-5795



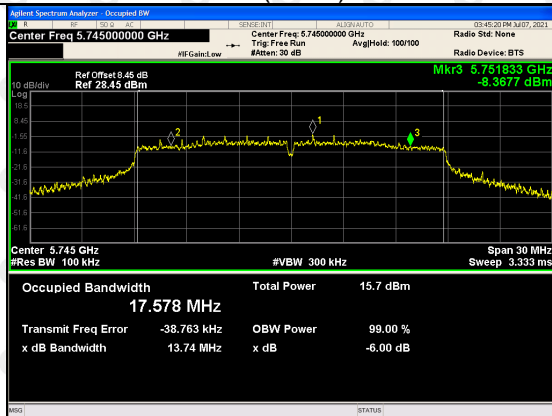
802.11ac(VH80)-5775



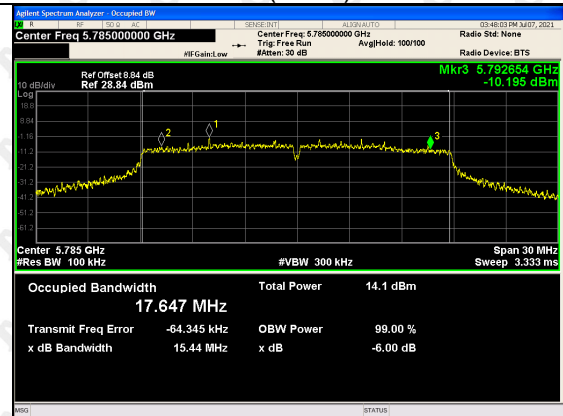
5745-5825MHz ANT2



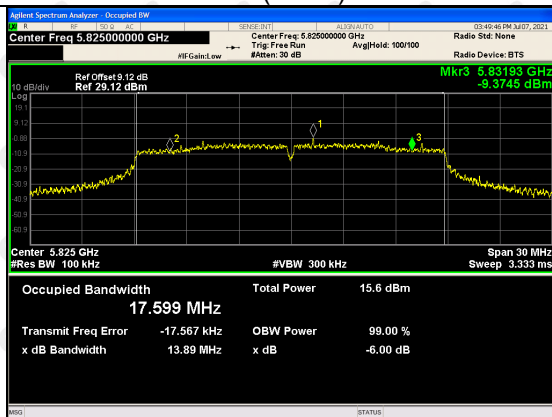
802.11ac(VH20)-5745



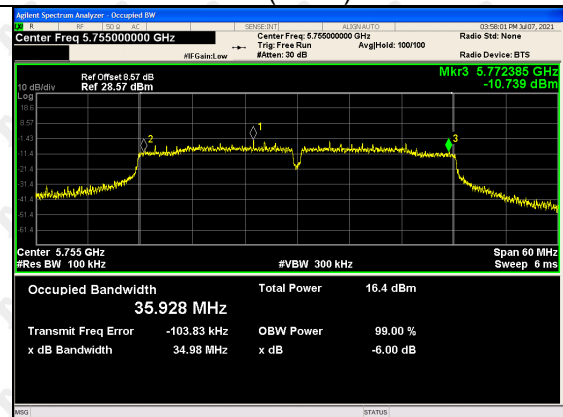
802.11ac(VH20)-5785



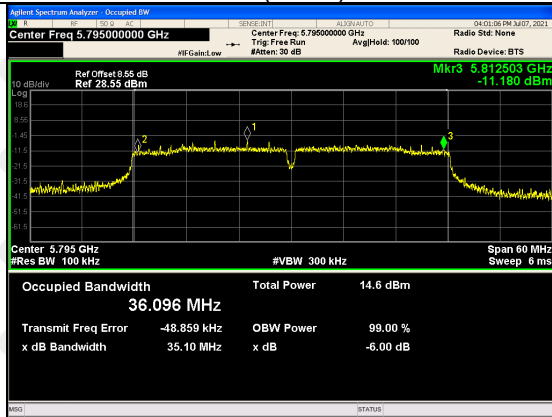
802.11ac(VH20)-5825



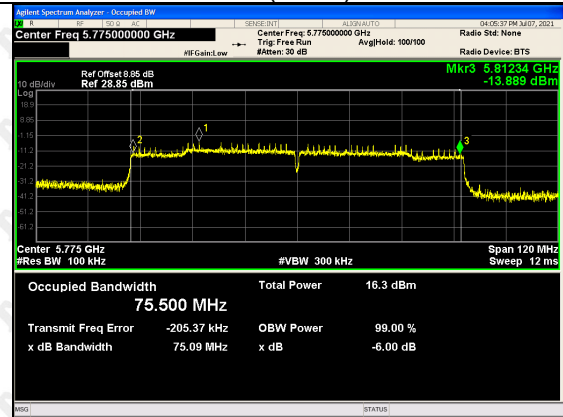
802.11ac(VH40)-5755



802.11ac(VH40)-5795

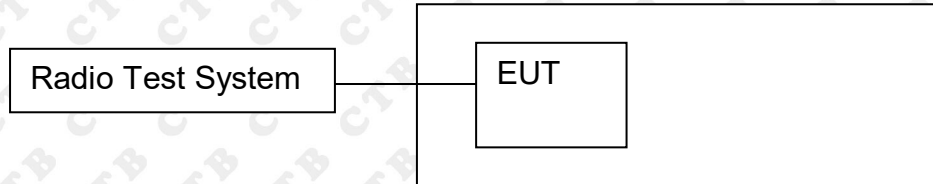


802.11ac(VH80)-5775



11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

11.3 Test procedure

According to KDB789033 D02v02r01 sectionE, the following is the measurement procedure.

For devices operating in the bands 5.15–5.25 GHz, 5.25–5.35 GHz, and 5.47–5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725–5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ($< 1 \text{ MHz}$, or $< 500 \text{ kHz}$) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set $\text{RBW} \geq 1/T$, where T is defined in II.B.1.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log (500 \text{ kHz/RBW})$ to the measured result, whereas RBW ($< 500 \text{ kHz}$) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log (1 \text{ MHz/RBW})$ to the measured result, whereas RBW ($< 1 \text{ MHz}$) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

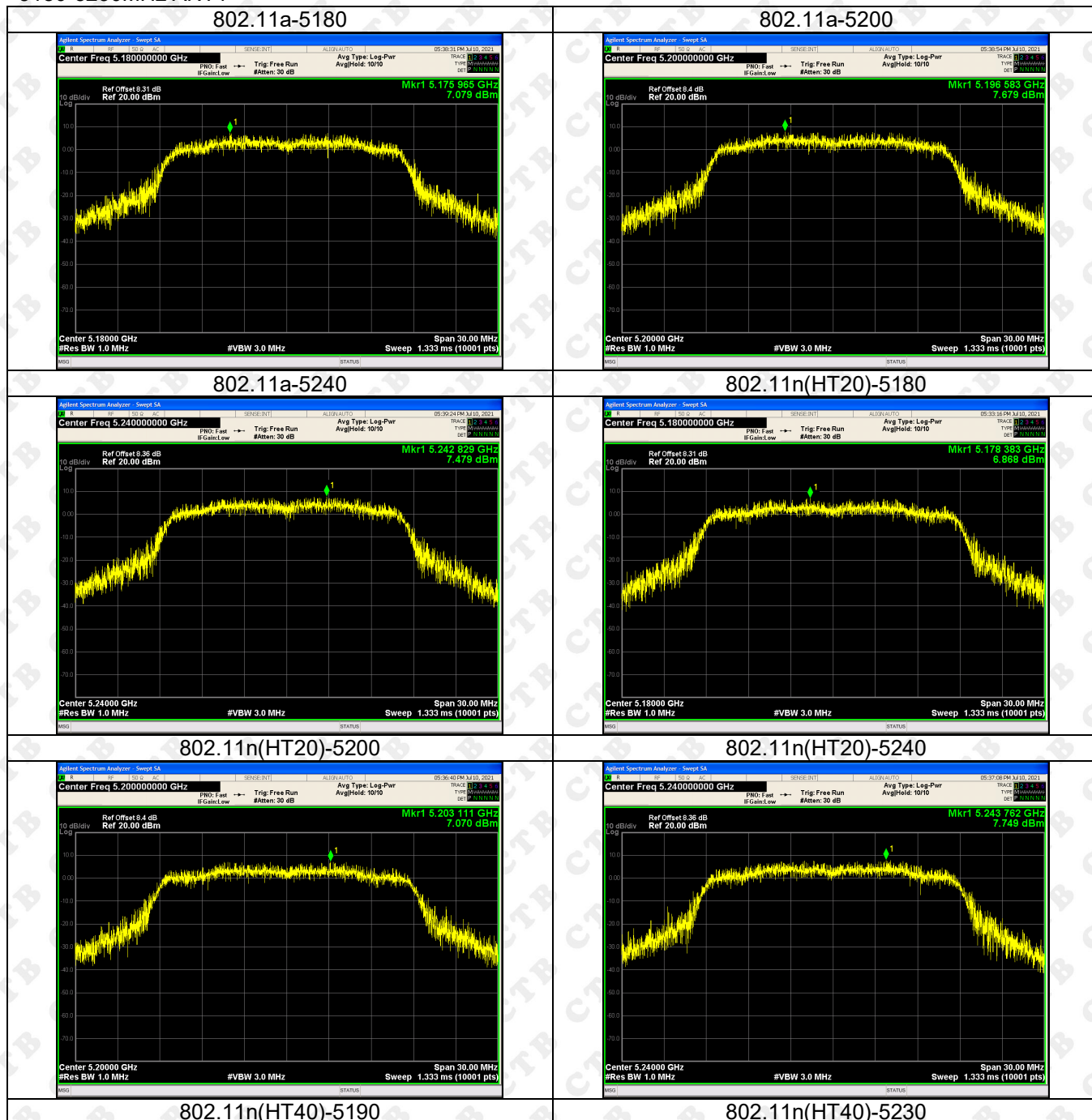
Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.

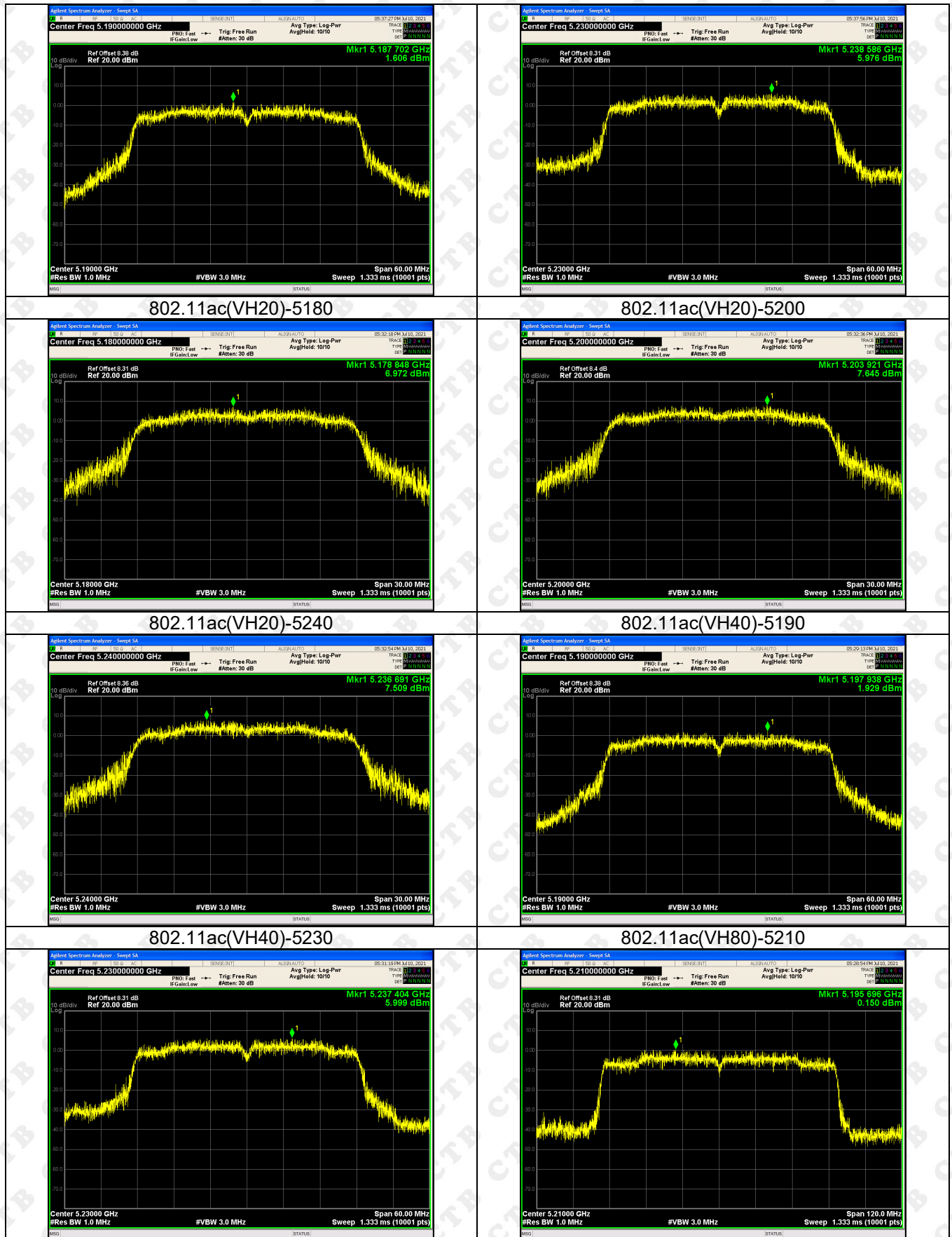
11.4 Test Result

Test mode	Test Channel (MHz)	PSD [dBm/MHz] ANT1	PSD [dBm/MHz] ANT2	PSD [dBm/500kHz] Total	Limit [dBm/MHz]	Result
802.11a	5180	7.079	7.562	10.338	11	Pass
	5200	7.679	7.539	10.620	11	Pass
	5240	7.479	7.072	10.291	11	Pass
802.11ac(VH20)	5180	6.972	7.137	10.066	11	Pass
	5200	7.645	7.248	10.461	11	Pass
	5240	7.509	7.659	10.595	11	Pass
802.11ac(VH40)	5190	1.929	2.183	5.068	11	Pass
	5230	5.999	6.076	9.048	11	Pass
802.11ac(VH80)	5210	0.15	1.246	3.743	11	Pass
802.11n(HT20)	5180	6.868	6.714	9.802	11	Pass
	5200	7.07	6.188	9.662	11	Pass
	5240	7.749	7.672	10.721	11	Pass
802.11n(HT40)	5190	1.606	2.747	5.224	11	Pass
	5230	5.976	6.168	9.083	11	Pass

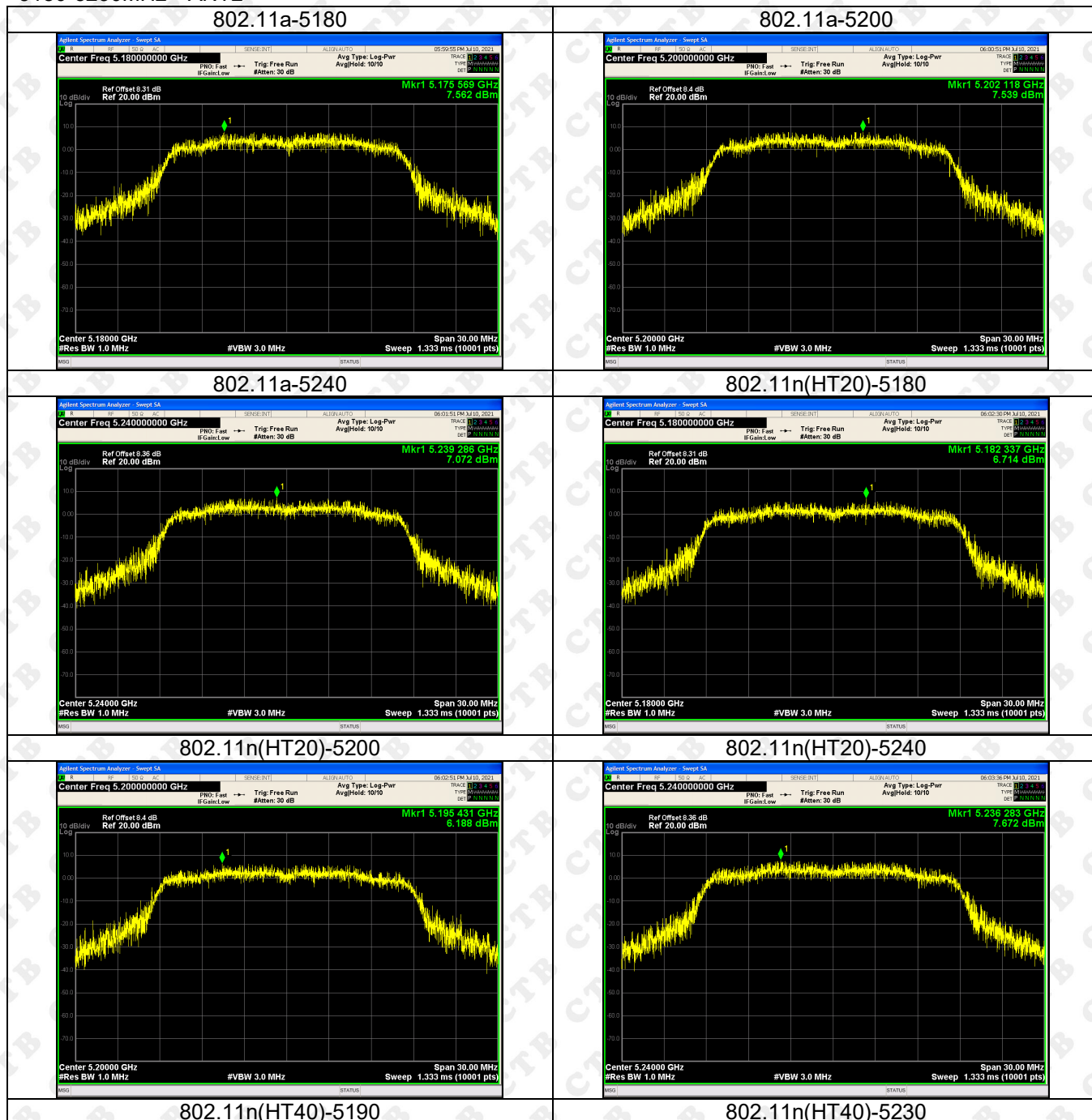
Test mode	Test Channel (MHz)	PSD [dBm/500kHz] ANT 1	PSD [dBm/500kHz] ANT 2	PSD [dBm/500kHz] Total	Result
802.11a	5745	3.922	2.949	6.473	Pass
	5785	1.963	1.708	4.848	Pass
	5825	3.753	4.327	7.060	Pass
802.11n(HT20)	5745	3.257	2.896	6.091	Pass
	5785	1.979	1.445	4.731	Pass
	5825	3.141	2.885	6.025	Pass
802.11n(HT40)	5755	-0.234	0.233	3.016	Pass
	5795	-2.101	-0.968	1.513	Pass
802.11ac(VH20)	5745	3.275	3.023	6.161	Pass
	5785	1.8	1.686	4.754	Pass
	5825	2.968	3.25	6.122	Pass
802.11ac(VH40)	5755	-0.302	0.207	2.970	Pass
	5795	-1.901	-0.797	1.696	Pass
802.11ac(VH80)	5775	-2.791	-2.646	0.292	Pass

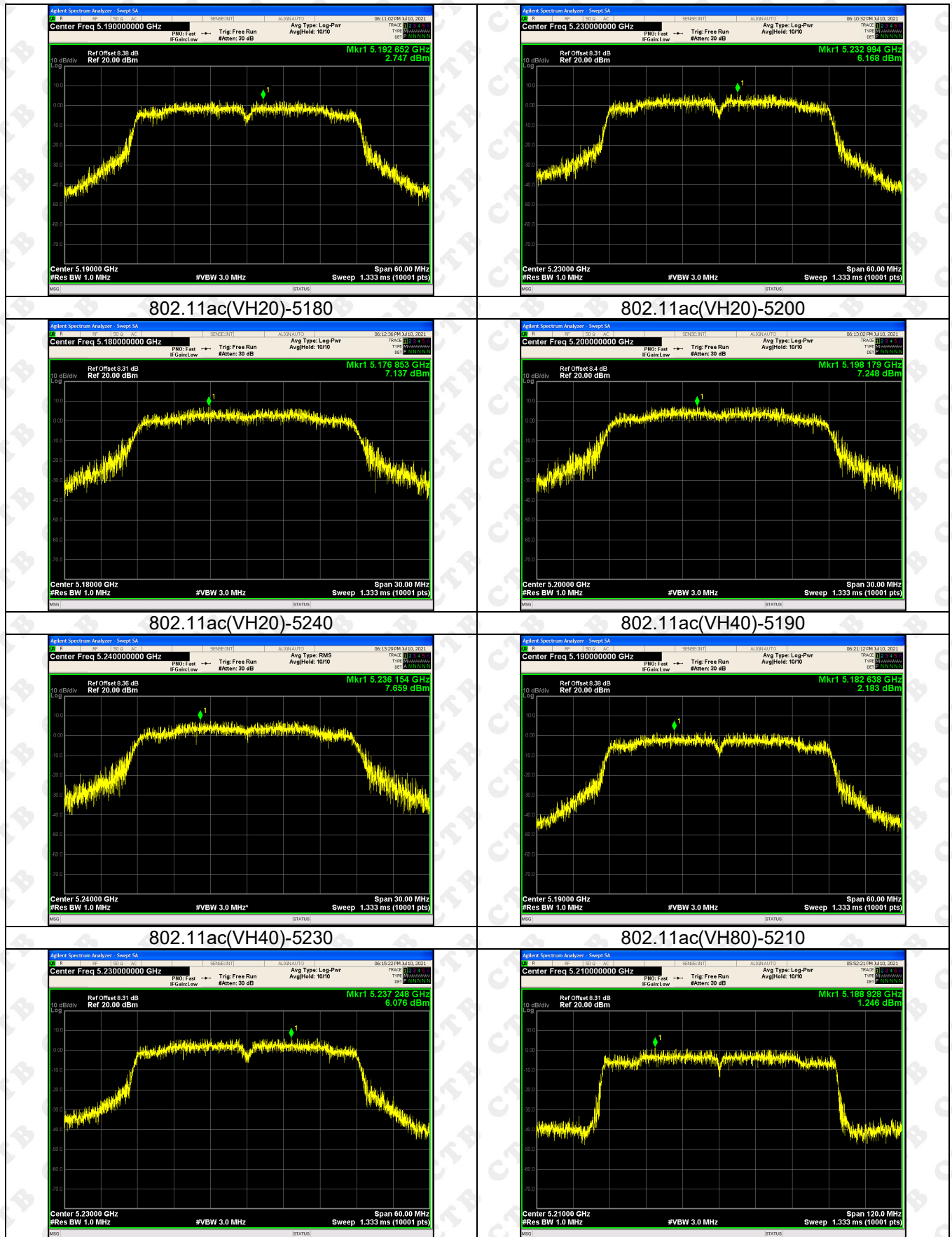
5180-5230MHz ANT1



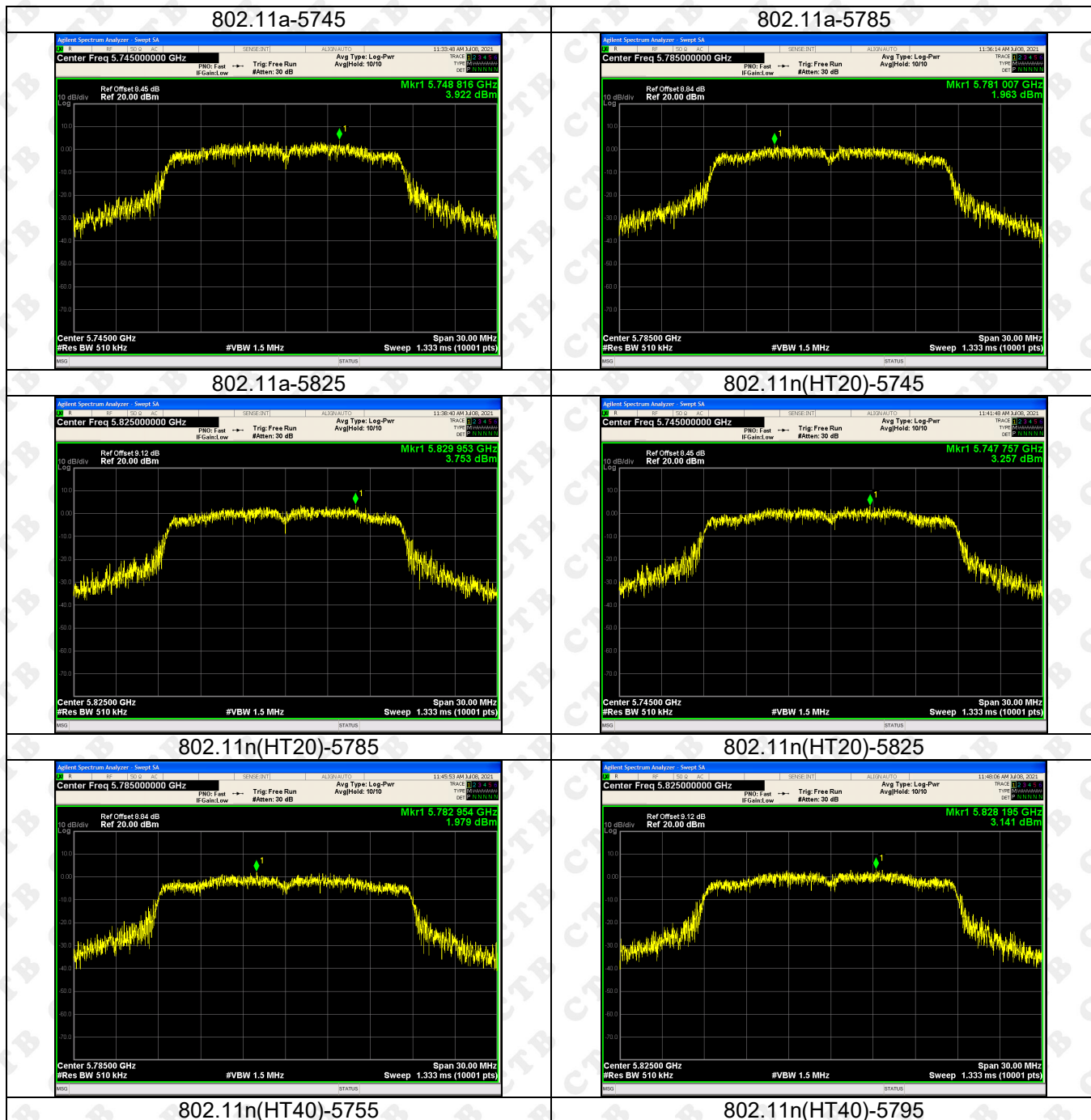


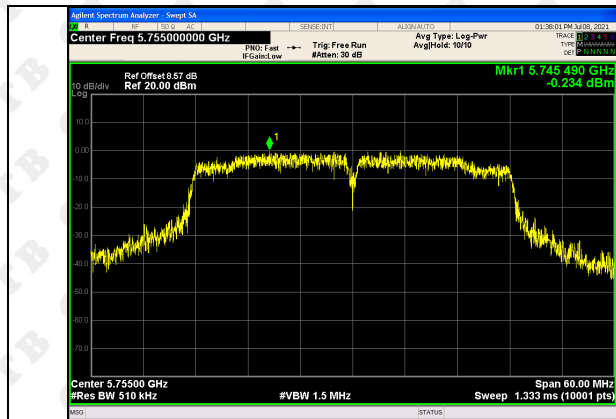
5180-5230MHz ANT2



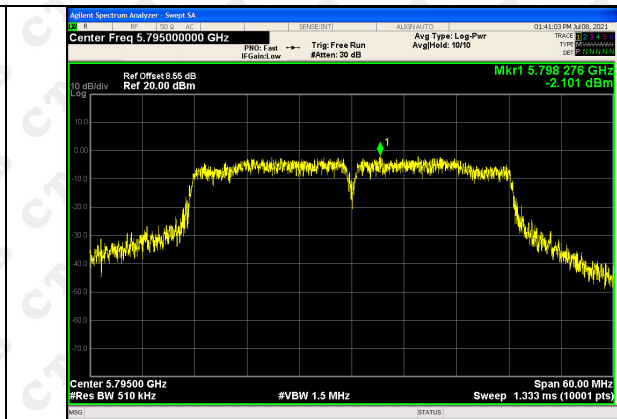


5745-5825MHz ANT 1

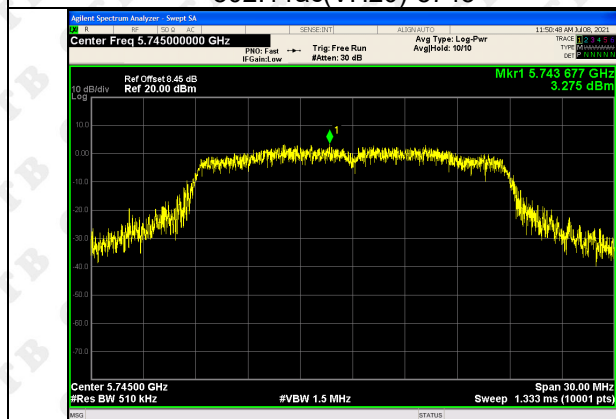




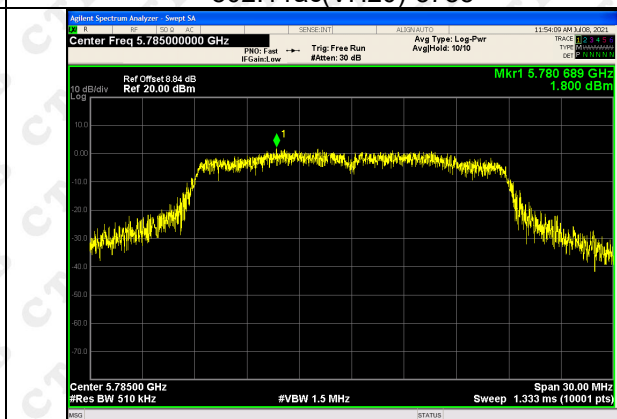
802.11ac(VH20)-5745



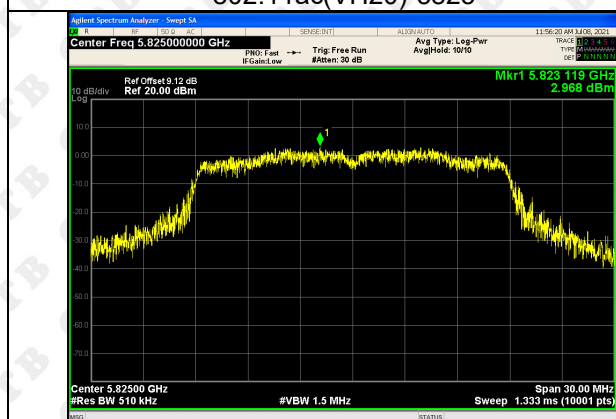
802.11ac(VH20)-5785



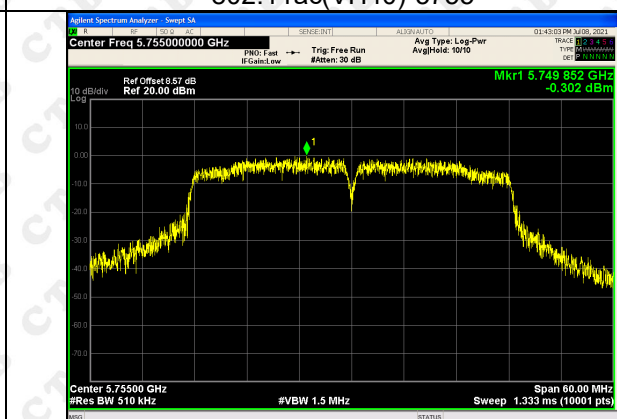
802.11ac(VH20)-5825



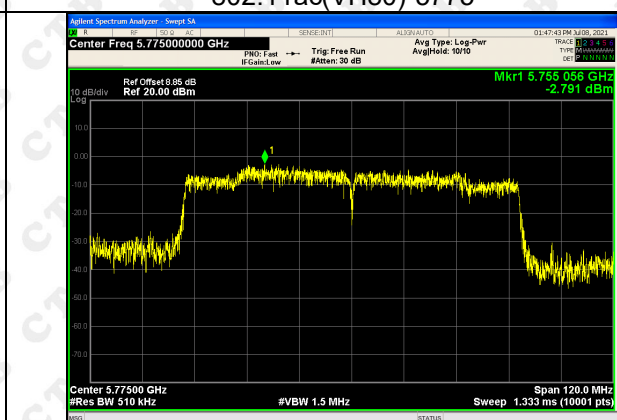
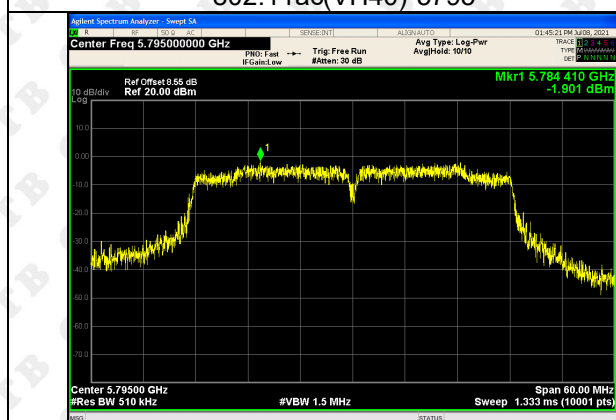
802.11ac(VH40)-5755



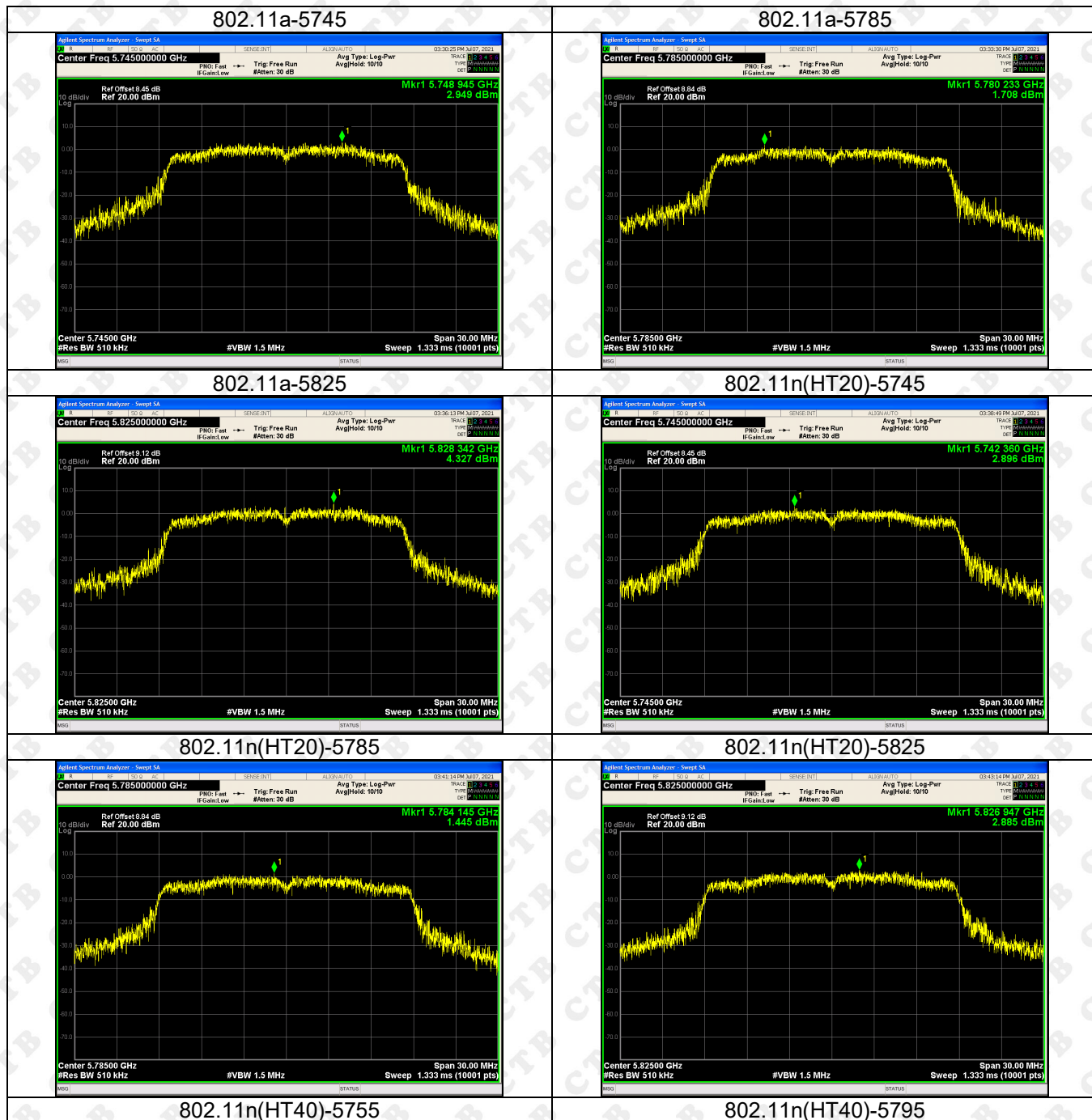
802.11ac(VH40)-5795

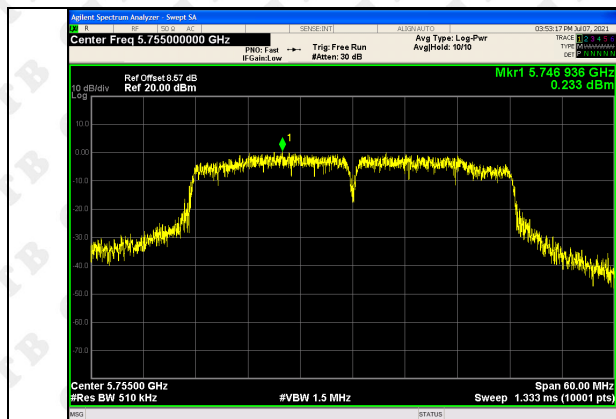


802.11ac(VH80)-5775

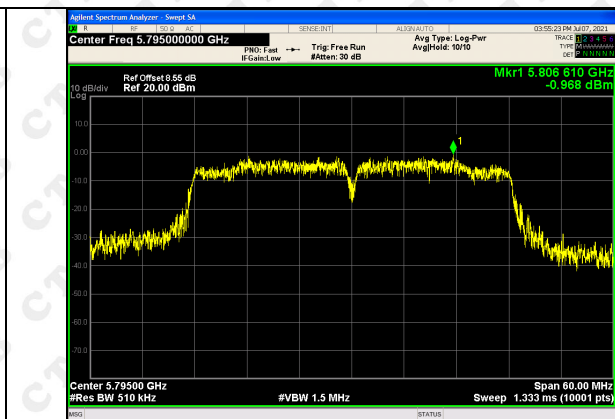


5745-5825MHz ANT 2

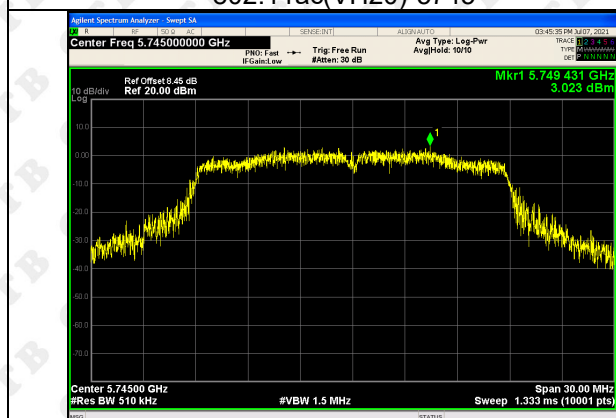




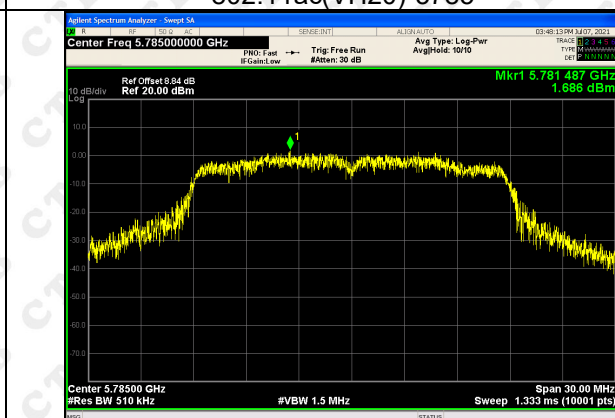
802.11ac(VH20)-5745



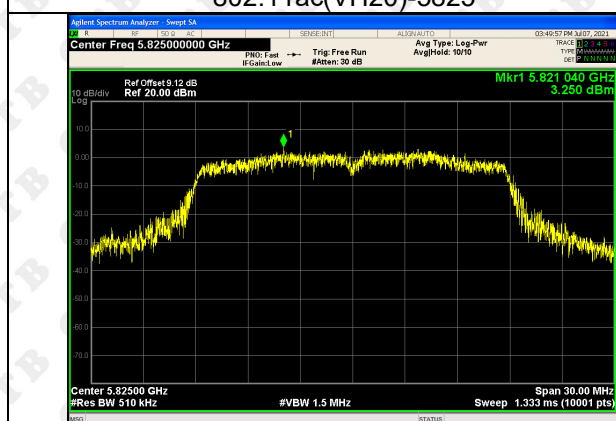
802.11ac(VH20)-5785



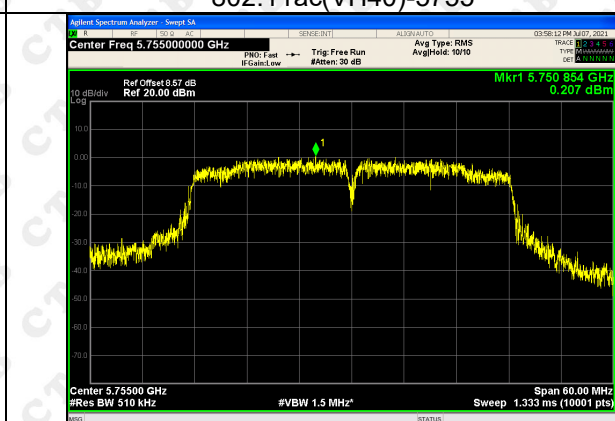
802.11ac(VH20)-5825



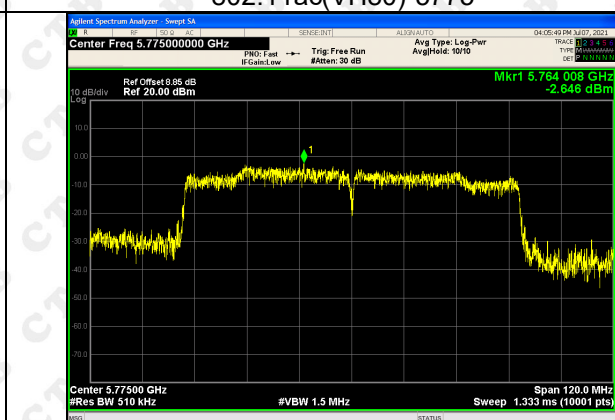
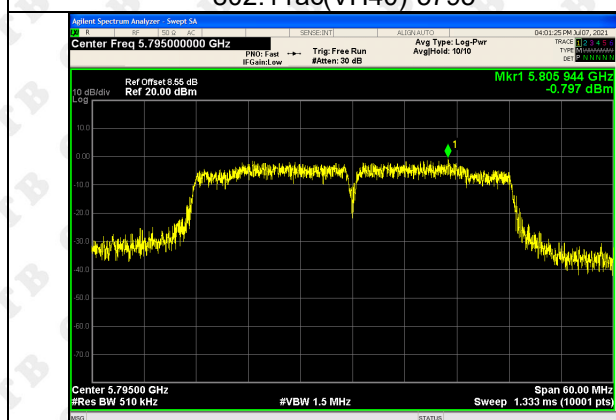
802.11ac(VH40)-5755



802.11ac(VH40)-5795

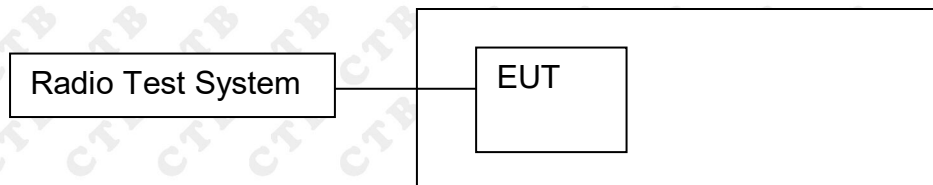


802.11ac(VH80)-5775



12. FREQUENCY STABILITY

12.1 Block Diagram Of Test Setup



12.2 Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

12.3 Test procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.

12.4 Test Result

TX Frequency (5180-5240MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	3.80	5180.0556	5180	0.0556	10.7336
		V max (V)	4.37	5180.0323	5180	0.0323	6.2355
		V min (V)	3.23	5180.0246	5180	0.0246	4.7490
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.8	T (°C)	-20	5180.0054	5180	0.0054	1.0425
		T (°C)	-10	5180.0105	5180	0.0105	2.0270
		T (°C)	0	5180.0323	5180	0.0323	6.2355
		T (°C)	10	5180.0386	5180	0.0386	7.4517
		T (°C)	20	5180.0293	5180	0.0293	5.6564
		T (°C)	30	5180.0218	5180	0.0218	4.2085
		T (°C)	40	5180.0125	5180	0.0125	2.4131
		T (°C)	50	5180.0097	5180	0.0097	1.8726
		T (°C)	60	5180.0414	5180	0.0414	7.9923
		T (°C)	70	5180.0697	5180	0.0697	13.4556
Limits				5150-5250 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5200.0254	5200	0.0254	4.8846
		V max (V)	5.75	5200.0428	5200	0.0428	8.2308
		V min (V)	4.25	5200.0694	5200	0.0694	13.3462
Limits				5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.8	T (°C)	-20	5200.0633	5200	0.0633	12.1731
		T (°C)	-10	5200.0526	5200	0.0526	10.1154
		T (°C)	0	5200.0434	5200	0.0434	8.3462
		T (°C)	10	5200.0928	5200	0.0928	17.8462
		T (°C)	20	5200.0635	5200	0.0635	12.2115
		T (°C)	30	5200.0124	5200	0.0124	2.3846
		T (°C)	40	5200.0733	5200	0.0733	14.0962
		T (°C)	50	5200.0416	5200	0.0416	8.0000
		T (°C)	60	5200.0325	5200	0.0325	6.2500
		T (°C)	70	5200.0427	5200	0.0427	8.2115
Limits				5150-5250 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5240.0136	5240	0.0136	2.5954
		V max (V)	5.75	5240.0414	5240	0.0414	7.9008
		V min (V)	4.25	5240.0097	5240	0.0097	1.8511
Limits				5150-5250 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.8	T (°C)	-20	5240.0094	5240	0.0094	1.7939
		T (°C)	-10	5240.0035	5240	0.0035	0.6679
		T (°C)	0	5240.0144	5240	0.0144	2.7481
		T (°C)	10	5240.0856	5240	0.0856	16.3359
		T (°C)	20	5240.0114	5240	0.0114	2.1756
		T (°C)	30	5240.0125	5240	0.0125	2.3855
		T (°C)	40	5240.0063	5240	0.0063	1.2023
		T (°C)	50	5240.0076	5240	0.0076	1.4504
		T (°C)	60	5240.0053	5240	0.0053	1.0115
		T (°C)	70	5240.0105	5240	0.0105	2.0038
Limits				5150-5250 MHz			
Result				Complies			

TX Frequency(5745-5825MHz)

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5745.01099	5745	0.01099	1.9126
		V max (V)	5.75	5745.00463	5745	0.00463	0.8055
		V min (V)	4.25	5745.00590	5745	0.00590	1.0272
Limits				5725-5850 MHz			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	3.8	T (°C)	-20	5745.01069	5745	0.01069	1.8615
		T (°C)	-10	5745.01249	5745	0.01249	2.1748
		T (°C)	0	5745.01119	5745	0.01119	1.9473
		T (°C)	10	5745.00332	5745	0.00332	0.5777
		T (°C)	20	5745.00111	5745	0.00111	0.1930
		T (°C)	30	5745.00867	5745	0.00867	1.5091
		T (°C)	40	5745.00264	5745	0.00264	0.4588
		T (°C)	50	5745.00005	5745	0.00005	0.0083
		T (°C)	60	5745.00755	5745	0.00755	1.3139
		T (°C)	70	5745.00425	5745	0.00425	0.7405
Limits				5725-5850 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5785.01228	5785	0.01228	2.1222
		V max (V)	5.75	5785.01045	5785	0.01045	1.8062
		V min (V)	4.25	5785.00821	5785	0.00821	1.4187
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5785.01103	5785	0.01103	1.9074
		T (°C)	-10	5785.00092	5785	0.00092	0.1596
		T (°C)	0	5785.00518	5785	0.00518	0.8960
		T (°C)	10	5785.01156	5785	0.01156	1.9974
		T (°C)	20	5785.00809	5785	0.00809	1.3980
		T (°C)	30	5785.01317	5785	0.01317	2.2759
		T (°C)	40	5785.00068	5785	0.00068	0.1167
		T (°C)	50	5785.00380	5785	0.00380	0.6562
		T (°C)	60	5785.01346	5785	0.01346	2.3274
		T (°C)	70	5785.00719	5785	0.00719	1.2430
Limits				5725-5850 MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	5.00	5825.00385	5825	0.00385	0.6607
		V max (V)	5.75	5825.01238	5825	0.01238	2.1258
		V min (V)	4.25	5825.01027	5825	0.01027	1.7624
Limits				5725-5850 MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	5	T (°C)	-20	5825.01348	5825	0.01348	2.3148
		T (°C)	-10	5825.00472	5825	0.00472	0.8108
		T (°C)	0	5825.01272	5825	0.01272	2.1828
		T (°C)	10	5825.01116	5825	0.01116	1.9166
		T (°C)	20	5825.00163	5825	0.00163	0.2791
		T (°C)	30	5825.00063	5825	0.00063	0.1078
		T (°C)	40	5825.00907	5825	0.00907	1.5563
		T (°C)	50	5825.00404	5825	0.00404	0.6939
		T (°C)	60	5825.00797	5825	0.00797	1.3683
		T (°C)	70	5825.00844	5825	0.00844	1.4483
Limits				5725-5850 MHz			
Result				Complies			

13. OPERATION IN THE ABSENCE OF INFORMATION TO THE TRANSMIT

13.1 Requirement

15.407(c) requirement:

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signal ling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

13.2 Test Results

Operation in the absence of information to the transmit:

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ASK message transmitting from remote device and verify whether it shall resend or discontinue transmission. (manufacturer declare)

14. ANTENNA REQUIREMENT

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is Internal Antenna and no consideration of replacement. The best case gain of the antenna is 1dBi.

15. EUT PHOTOGRAPHS

EUT Photo 1



EUT Photo 2



16. EUT TEST SETUP PHOTOGRAPHS

Spurious emissions

Below 1GHz



Above 1G



Conducted Emission



***** END OF REPORT *****